USDA Natural Resources
Conservation Service

Ecological site R109XY028MO
Loamy Upland Drainageway Savanna

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 109X–Iowa and Missouri Heavy Till Plain

The Iowa and Missouri Heavy Till Plain is an area of rolling hills interspersed with interfluve divides and alluvial valleys. Elevation ranges from about 660 feet (200 meters) along the lower reaches of rivers, to about 980 feet (300 meters) on stable interfluve summits in southern Iowa. Relief is about 80 to 160 feet (25 to 50 meters) between major streams and adjacent interfluve summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoisan aged till on interfluves, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a Mesic Bottomland Woodland.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to Quercus macrocarpa - (Quercus alba, Quercus velutina) / Andropogon gerardii Wooded Herbaceous Vegetation (CEGL002159).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs in several Land Type Associations, primarily within the following Subsections:
Grand River Hills
Loess Hills

Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. As additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Loamy Upland Drainageway Savannas are scattered in small delineations in the upland portions of the MLRA, particularly in the west and in adjacent areas to the southwest. They are associated with Floodplain Woodland and Wet Floodplain Prairie sites downstream, and with adjacent upland ecological sites. Soils are loamy, and are subject to flooding. The reference plant community is savanna with scattered bur oak, pin oak, American elm, shellbark hickory and prairie willow, shrubs, and a ground flora of grasses such as big bluestem, little bluestem, Indiangrass, switchgrass, and eastern gamagrass, and a wide variety of prairie wildflowers.

Associated sites

R109XY012MO	**Interbedded Sedimentary Backslope Savanna** Shale Backslope Savannas are upslope in some places, on steep lower backslopes.
R109XY046MO	**Till Upland Savanna** Till Upland Savannas are upslope, on gently sloping upper backslopes.

Similar sites

R109XY034MO	**Loamy Terrace Savanna** Loamy Terrace Savannas are similar in composition and structure but occur on stream terraces and high floodplains and experience less flooding.

Table 1. Dominant plant species

Tree	(1) *Quercus macrocarpa*
Shrub	(1) *Salix humilis*
Herbaceous	(1) *Andropogon gerardii* (2) *Tripsacum dactyloides*

Physiographic features

This site is in narrow drainageways in the uplands, with slopes of 1 to 5 percent. The site receives runoff from adjacent upland sites. Most areas are subject to frequent, brief flooding.

The following figure (adapted from Jeffrey, 1974) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the uplands. The site is within the area labeled “4”, and is typically downslope from Till Upland Savanna ecological sites. In places a thin band of Interbedded Sedimentary Backslope Savanna is present adjacent to the Upland Drainageway.

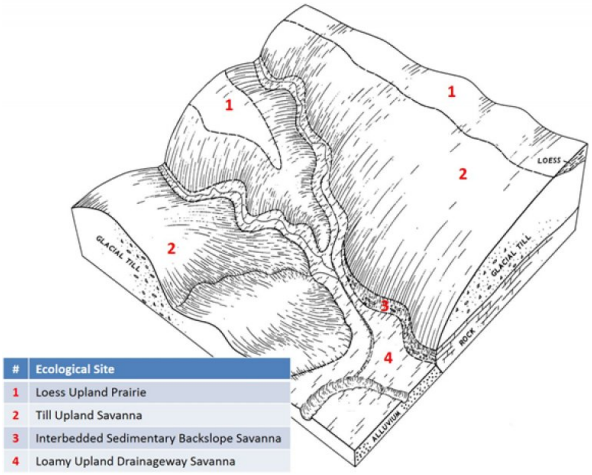


Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Slope	1–5%
Water table depth	24–72 in
Aspect	Aspect is not a significant factor

Climatic features

The Iowa and Missouri Heavy Till Plain MLRA has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

This MLRA experiences small regional differences in climates that grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit fairly minor gradients along this line. Mean January minimum temperature follows the north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.

Mean annual precipitation varies along the same gradient as temperature – lower annual precipitation in the north, higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages four to five times greater than January precipitation. During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects ecological communities by increasing plant and animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or

microclimatic variations. For example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

Source: University of Missouri Climate Center - http://climate.missouri.edu/climate.php; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Table 3. Representative climatic features

Frost-free period (characteristic range)	136-148 days
Freeze-free period (characteristic range)	160-178 days
Precipitation total (characteristic range)	37-41 in
Frost-free period (actual range)	135-153 days
Freeze-free period (actual range)	158-186 days
Precipitation total (actual range)	36-42 in
Frost-free period (average)	143 days
Freeze-free period (average)	170 days
Precipitation total (average)	39 in

Climate stations used

- (1) BROOKFIELD [USC00230980], Brookfield, MO
- (2) GRANT CITY [USC00233369], Grant City, MO
- (3) HAMILTON 2W [USC00233568], Hamilton, MO

Influencing water features

This ecological site contains first-order streams, which originate from headslope positions at the upper reaches of the units, and are fed from smaller headslopes in the adjacent uplands. The lower reaches of units often contain second-order streams. These streams are ephemeral in most years, with flow in the late fall, winter, and spring months, generally disappearing in the summer, or reduced to isolated pools in the lower reaches. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short-duration flooding is common in many areas. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet.

Soil features

These soils have no rooting restriction. The soils were formed under prairie vegetation, and have thick, dark-colored surface horizons. Parent material is alluvium. Surface horizons are silt loam. Subsurface horizons are loamy. These soils are not affected by seasonal wetness. Soil series associated with this site include Kennebec and Wiota.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained

Permeability class	Slow to moderately slow
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	8–9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The reference plant community is characterized as a loamy bur oak savanna unit with a ground cover dominated by big bluestem, little bluestem, Indiangrass, switchgrass, eastern gamagrass and a wide variety of prairie wildflowers while other species such as Culver’s root, Michigan lily, and Virginia bunchflower add to the mix of upland drainageway prairie species. Slightly higher areas of the drainageways supported scattered bur oak, pin oak, elm, shellbark hickory and willow.

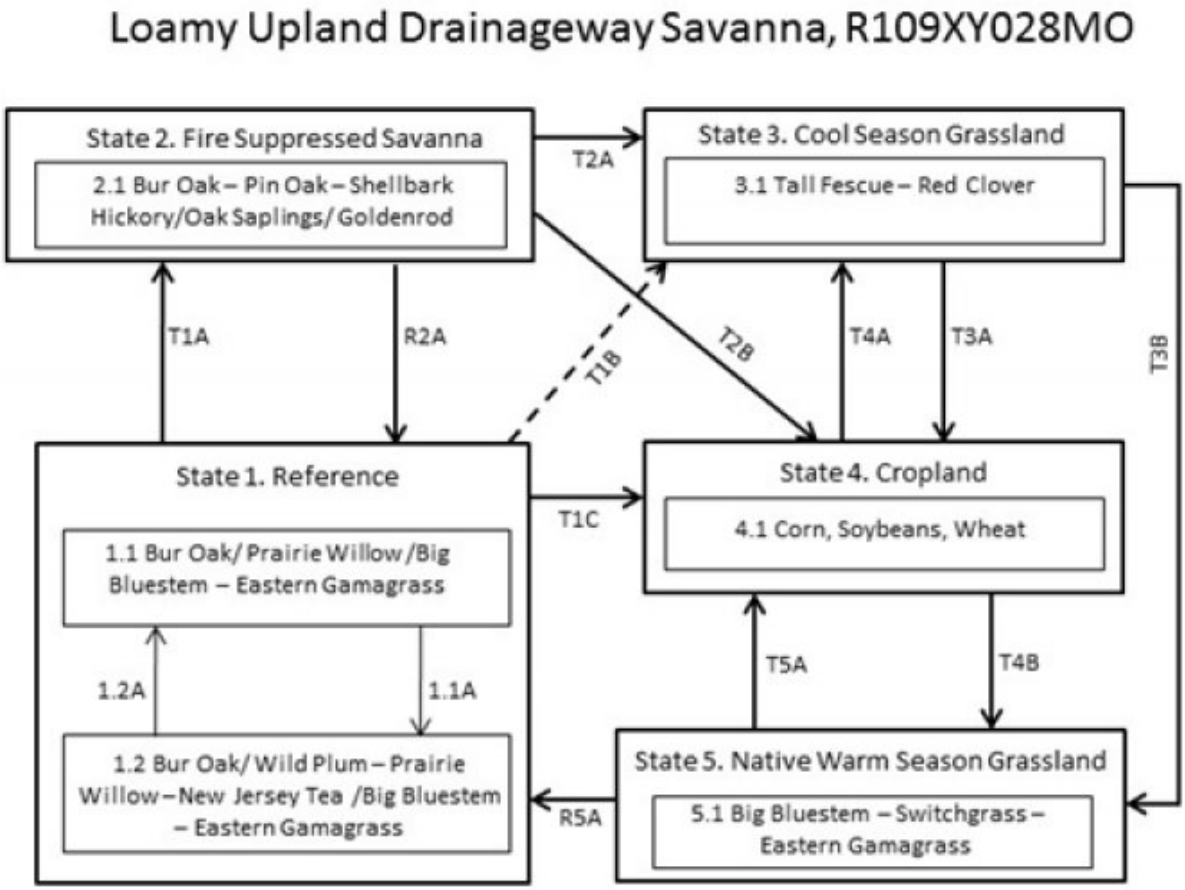
These areas flooded frequently but briefly. In addition to the flooding and periodic wetness, fire played a key role, likely occurring at least once every 3 years. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also controlled woody species. Grazing by native large herbivores, such as bison, elk, and white-tailed deer, furthermore impacted these sites.

Their activities altered the composition, fuel loads and structure of the vegetation, creating a diversity of structure and composition. The partially wooded drainageway core would have burned less intensely and less frequently. During fire free intervals woody species would have increased in abundance and spread out into the landscape.

These sites are productive. Today, Loamy Upland Drainageway Savannas are nearly extirpated from the region as the former high terrace prairies and savannas have been converted to intensive agriculture. Very few, if any, quality remnants exist. While re-establishing prairie and savanna on converted agriculture sites is beneficial to wildlife, restoration to the reference state from agricultural land is a long term proposition with uncertain outcomes.

A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

State and transition model



Code	Event/Activity/Process
T1A	Fire suppression > 20 years; woody invasion
T1B	Tillage; vegetative seeding; grassland management
T1C, T3A, T5A	Tillage; conservation cropping system
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
T3B, T4B	Vegetative seeding; prescribed fire; grassland management
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 1-3 years
R2A	Woody removal; thinning; prescribed fire 1-3 years
R5A	Vegetative seeding; prescribed fire 1-3 years; tree planting; long rotation

Figure 9. State and transition diagram for this ecological s

State 1

Reference

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- prairie willow (*Salix humilis*), shrub
- New Jersey tea (*Ceanothus americanus*), shrub
- plum (*Prunus*), shrub
- big bluestem (*Andropogon gerardii*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass

Community 1.1
Bur Oak/ Prairie Willow /Big Bluestem – Eastern Gamagrass

This phase is a savanna dominated by big bluestem, Eastern gamagrass and a wide variety of prairie wildflowers. Bur oak, swamp white oak, pin oak, shellbark hickory, American hazelnut, prairie willow and wild plum occur in small groves or as scattered individuals across the open landscape.

Forest overstory. The Forest Overstory Species list is based on commonly occurring species listed in Nelson (2010).

Forest understory. The Forest Understory list is based on commonly occurring species listed in Nelson (2010).

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- prairie willow (*Salix humilis*), shrub
- big bluestem (*Andropogon gerardii*), other herbaceous
- eastern gamagrass (*Tripsacum dactyloides*), other herbaceous

Community 1.2
Bur Oak/ Wild Plum – Prairie Willow – New Jersey Tea /Big Bluestem – Eastern Gamagrass

This phase is similar to community phase 1.1 but oaks and shrubs are increasing due to longer periods of fire suppression. Some displacement of grasses and forbs may be occurring due to shading and competition from the increased canopy cover.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- plum (*Prunus*), shrub
- prairie willow (*Salix humilis*), shrub
- New Jersey tea (*Ceanothus americanus*), shrub
- big bluestem (*Andropogon gerardii*), other herbaceous
- eastern gamagrass (*Tripsacum dactyloides*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Fire-free interval 10+ years

Pathway 1.1A
Community 1.2 to 1.1

Fire-free interval 10+ years

State 2
Fire Suppressed Savanna

Degraded reference states that have experienced fire suppression and woody invasion for 20 or more years will transition to this state. With fire suppression, woody species such as bur oak, pin oak, and shellbark hickory will begin to increase transitioning this state from a savanna to an open woodland. Native herbaceous ground cover will also decrease.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- pin oak (*Quercus palustris*), tree
- shellbark hickory (*Carya laciniosa*), tree
- oak (*Quercus*), shrub
- goldenrod (*Oligoneuron*), other herbaceous

Community 2.1
Bur Oak – Pin Oak – Shellbark Hickory/Oak Saplings/ Goldenrod

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- pin oak (*Quercus palustris*), tree
- shellbark hickory (*Carya laciniosa*), tree
- oak (*Quercus*), shrub
- goldenrod (*Oligoneuron*), other herbaceous

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue and red clover has been common in this area. Occasionally, these pastures may have scattered bur oaks. Long term uncontrolled grazing and a lack of grassland management can cause significant soil erosion and compaction and increases in less productive species such as Kentucky bluegrass and weedy forbs such as ironweed. A return to the reference state may be impossible, requiring a very long term series of management options.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1
Tall Fescue – Red Clover

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

State 4
Cropland

This is the dominant State that exists currently with intensive cropping of corn, wheat and soybeans occurring. Some conversion to cool season hay land may occur for a limited period of time before transitioning back to cropland. Limited acres are sometimes converted to native warm season grassland through federal set-aside programs.

Dominant plant species

- corn (*Zea*), other herbaceous
- soybean (*Glycine*), other herbaceous
- wheat (*Triticum*), other herbaceous

Community 4.1
Corn, Soybeans, Wheat

Dominant plant species

- corn (*Zea*), other herbaceous
- soybean (*Glycine*), other herbaceous
- wheat (*Triticum*), other herbaceous

State 5
Native Warm Season Grassland

Conversion from the Cool Season Grassland (State 3) or the Cropland (State 4) to this state is increasing due to renewed interest in warm season grasses as a supplement to cool season grazing systems or as a native restoration activity. This state can be transformed back to a reference state. Substantial restoration time and management inputs and costs will still be needed.

Dominant plant species

- big bluestem (*Andropogon gerardii*), other herbaceous
- switchgrass (*Panicum virgatum*), other herbaceous
- eastern gamagrass (*Tripsacum dactyloides*), other herbaceous

Community 5.1
Big Bluestem – Switchgrass – Eastern Gamagrass

Dominant plant species

- big bluestem (*Andropogon gerardii*), other herbaceous
- switchgrass (*Panicum virgatum*), other herbaceous
- eastern gamagrass (*Tripsacum dactyloides*), other herbaceous

Transition T1A
State 1 to 2

Fire suppression >20 years; woody invasion

Transition T1B
State 1 to 3

Tillage; vegetative seeding; grassland management

Transition T1C
State 1 to 4

Tillage; conservation cropping system

Restoration pathway R2A
State 2 to 1

Woody removal; thinning; prescribed fire 1-3 years

Transition T2A
State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T2B
State 2 to 4

Woody removal; tillage; conservation cropping system

Transition T3A
State 3 to 4

Tillage; conservation cropping system

Transition T3B
State 3 to 5

Vegetative seeding; prescribed fire; grassland management

Restoration pathway T4A
State 4 to 3

Vegetative seeding; grassland management

Transition T4B
State 4 to 5

Vegetative seeding; prescribed fire; grassland management

Restoration pathway T5A
State 5 to 4

Tillage; conservation cropping system

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
bur oak	QUMA2	*Quercus macrocarpa*	Native	–	5–20	–	–
pin oak	QUPA2	*Quercus palustris*	Native	–	5–20	–	–
shellbark hickory	CALA21	*Carya laciniosa*	Native	–	5–20	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
big bluestem	ANGE	*Andropogon gerardii*	Native	–	30–50
eastern gamagrass	TRDA3	*Tripsacum dactyloides*	Native	–	10–30
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	10–20
Indiangrass	SONU2	*Sorghastrum nutans*	Native	–	10–20
switchgrass	PAVI2	*Panicum virgatum*	Native	–	10–20
prairie dropseed	SPHE	*Sporobolus heterolepis*	Native	–	5–10
Forb/Herb					
button eryngo	ERYU	*Eryngium yuccifolium*	Native	–	5–20
prairie milkweed	ASSU3	*Asclepias sullivantii*	Native	–	5–20
wholeleaf rosinweed	SIIN2	*Silphium integrifolium*	Native	–	5–20
white wild indigo	BAAL	*Baptisia alba*	Native	–	5–20
purple prairie clover	DAPU5	*Dalea purpurea*	Native	–	5–20
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	5–20
compassplant	SILA3	*Silphium laciniatum*	Native	–	5–20
hoary puccoon	LICA12	*Lithospermum canescens*	Native	–	5–20
wild quinine	PAIN3	*Parthenium integrifolium*	Native	–	5–20
butterfly milkweed	ASTU	*Asclepias tuberosa*	Native	–	5–20
prairie blazing star	LIPY	*Liatris pycnostachya*	Native	–	5–20
Missouri goldenrod	SOMI2	*Solidago missouriensis*	Native	–	5–20
ashy sunflower	HEMO2	*Helianthus mollis*	Native	–	5–20
wild bergamot	MOFI	*Monarda fistulosa*	Native	–	5–20
Culver's root	VEVI4	*Veronicastrum virginicum*	Native	–	5–20
Virginia bunchflower	VEVI5	*Veratrum virginicum*	Native	–	5–20
purple milkwort	POSA3	*Polygala sanguinea*	Native	–	5–10
Michigan lily	LIMI9	*Lilium michiganense*	Native	–	5–10
Shrub/Subshrub					
prairie willow	SAHU2	*Salix humilis*	Native	–	5–20
New Jersey tea	CEAM	*Ceanothus americanus*	Native	–	5–10
American plum	PRAM	*Prunus americana*	Native	–	0–10
American hazelnut	COAM3	*Corylus americana*	Native	–	5–10
leadplant	AMCA6	*Amorpha canescens*	Native	–	5–10

Animal community

Wildlife
Prairie Phase:
Game species that utilize this ecological site include:
Northern Bobwhite will utilize this ecological site for food (seeds, insects) and cover needs (escape, nesting and roosting cover).

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, and insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover.

Bird species associated with this ecological site's reference state condition:
Breeding birds as related to vegetation structure (related to time since fire, grazing, haying, and mowing):

Vegetation Height Short (0.5 meter, low litter levels, bare ground visible):
Grasshopper Sparrow, Horned Lark, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite

Mid-Vegetation Height (0.5 – 1 meter, moderate litter levels, some bare ground visible):
Eastern Meadowlark, Dickcissel, Field Sparrow, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite, Eastern Kingbird, Bobolink, Lark Sparrow

Tall Vegetation Height (> 1 meter, moderate-high litter levels, little bare ground visible):
Henslow's Sparrow, Dickcissel, Greater Prairie Chicken, Field Sparrow, Northern Bobwhite, Sedge Wren, Northern Harrier

Brushy – Mix of grasses, forbs, native shrubs (e.g., Rhus copallina, Prunus americana, Rubus spp., Rosa carolina) and small trees (e.g., Cornus racemosa): Bell's Vireo, Yellow-Breasted Chat, Loggerhead Shrike, Brown Thrasher, Common Yellowthroat

Winter Resident: Short-Eared Owl, Le Conte's Sparrow

Amphibian and reptile species associated with this ecological site's reference state condition: prairies with or nearby to fishless ponds/pools (may be ephemeral) may have Eastern Tiger Salamander (Ambystoma tigrinum tigrinum) and Western Chorus Frog (Pseudacris triseriata triseriata); prairies with crawfish burrows may have Northern Crawfish Frog (Rana areolata circulosa); other species include Northern Prairie Skink (Eumeces septentrionalis septentrionalis), Ornate Box Turtle (Terrapene ornata ornata), Western Slender Glass Lizard (Ophisaurus attenuatus attenuatus), Eastern Yellow-bellied Racer (Coluber constrictor flaviventris), Prairie Ring-necked Snake (Diadophis punctatus arnyi), and Bullsnake (Pituophis catenifer sayi).

Small mammals associated with this ecological site's reference state condition: Least Shrew (Cryptotis parva), Franklin's Ground Squirrel (Spermophilus franklinii), Plains Pocket Gopher (Geomys bursarius), Prairie Vole (Microtus ochrogaster), Southern Bog Lemming (Synaptomys cooperi), Meadow Jumping Mouse (Zapus hudsonius), Thirteen-lined Ground Squirrel (Spermophilus tridecemlineatus) and Badger (Taxidea taxus).

Invertebrates: Many native insect species are likely associated with this ecological site, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However information on these groups is often lacking enough resolution to assign them to individual ecological sites.

Insect species known to be associated with this ecological site's reference state condition: Regal Fritillary butterfly (Speyeria idalia) whose larvae feed primarily on native prairie violets (Viola pedata, V. pedatifida, and V. sagittata); Mottled Dusky Wing butterfly (Erynnis martialis), Golden Byssus butterfly (Problema byssus kumskaka), Delaware Skipper butterfly (Atryone logan logan), and Crossline Skipper butterfly (Polites origenes). The larvae of the moth Eucosma bipunctella bore into compass plant (Silphium laciniatum) roots and feed and the larvae of the moth Eucosma giganteana bore into a number of Silphium species roots and feed. Native bees, important pollinators, that may be associated with this ecological site's reference condition include: Colletes brevicornis, Andrena beameri, A. helianthiformis, Protandrena rudbeckiae, Halictus parallelus, Lasioglossum albipennis, L. coreopsis, L. disparilis, L. nymphaereum, Ashmeadiella bucconis, Megachile addenda, Anthidium psoraleae, Eucera hamata, Melissodes coloradensis, M. coreopsis, and M. vernoniae. The Short-winged Katydid (Amblycorypha parvipennis), Green Grasshopper (Hesperotettix speciosus) and Two-voiced Conehead katydid (Neoconcephalus bivocatus) are possible orthopteran associates of this ecological site.

Other invertebrate associates include the Grassland Crayfish (Procambarus gracilis).

Savanna Phase:
Oaks and hickories provide an important food source for many animals including White-tailed Deer, Wild Turkey, and Fox Squirrel.

Both snags and live cavity or den trees provide important food and cover for vertebrate wildlife. Snags are also very important to invertebrate species. Fox Squirrel, Red-headed Woodpecker and Eastern Bluebird utilize snags and den trees for foraging, nesting or shelter. “Wolf” trees are a particularly valuable type of live cavity tree. These large diameter, often open-grown, old-ages, hollow trees provide both cavities for wildlife and usually hard or soft mast food sources. Large diameter snags and den trees are particularly important wildlife habitat features to retain.

Game species that utilize this ecological site include:
Northern Bobwhite will utilize this ecological site for food (seeds, insects) and cover needs (escape, nesting and roosting cover).

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover.

Bird species associated with this ecological site’s reference state condition:
Breeding birds: Northern Bobwhite, Eastern Kingbird, Eastern Bluebird, Brown Thrasher, White-eyed Vireo, Prairie Warbler, Field Sparrow, Eastern Towhee, Red-headed Woodpecker, Great Crested Flycatcher, Loggerhead Shrike

Winter resident: American Tree Sparrow, Harris’ Sparrow

Amphibian and reptile species likely associated with this ecological site’s reference state condition: Ornate Box Turtle (Terrapene ornata ornata), Northern Fence Lizard (Sceloporus undulates hyacinthinus), Five-lined Skink (Eumeces fasciatus), Western Slender Glass Lizard (Ophisaurus attenuatus attenuatus), Eastern Yellow-bellied Racer (Coluber constrictor flaviventris), Prairie Ring-necked Snake (Diadophis punctatus arnyi), and Rough Green Snake (Opheodrys aestivus aestivus). Sites containing or nearby to fishless or ephemeral ponds/pools may support the Eastern Tiger Salamander (Ambystoma tigrinum tigrinum).

Small mammals likely associated with this ecological site’s reference state condition: Fox Squirrel (Sciurus niger), Woodland Vole (Microtus pinetorum), Least Shrew (Cryptotis parva), and Indiana Bat (Myotis sodalis). Indiana bats utilize suitable live, dying or dead roost trees for summer habitat and raising young. Suitable roost trees typically have exfoliating or flaking bark and are larger in diameter.

Invertebrates – Many native insect species are likely associated with this phase of this ecological site’s reference state condition, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However we don’t have enough information on these groups to assign them to this phase of this ecological site’s reference state condition at this time.

(This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013. References for this section: Fitzgerald and Pashley 2000b; Heitzman and Heitzman 1996; Jacobs 2001; Johnson 2000; Pitts and McGuire 2000; Schwartz and others 2001)

Other information

Forestry
Management: This ecological site is not recommended for traditional timber management activity. Historically this site was dominated by a ground cover of native prairie grasses and forbs. Some scattered open grown trees were also present. Altered sites may be suitable for non-traditional forestry uses such as windbreaks, environmental plantings, alley cropping (a method of planting, in which rows of trees or shrubs are interspersed with rows of crops) or woody bio-fuels.

Inventory data references

Potential Reference Sites: Loamy Upland Drainageway Savanna

No quality reference sites are known to exist.

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Contributors

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Approval

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/10/2025
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**